



The MONITOR

A Newsletter for National Park Service
Air Quality Station Operators

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NETWORK NEWS

Operator training CD coming to all stations this spring

The National Park Service Air Resources Division, Air Resource Specialists, Inc., and the Cooperative Institute for Research in the Atmosphere are developing a station operator training CD, which is expected to be completed later this spring. All ambient air quality station operators will receive a CD, which can be run from each station's DataView computer.

The CD will contain:

- An introduction to National Park Service network goals and objectives
- Organization of the network, including the various agencies, individuals, and programs that contribute to the monitoring effort
- Configuration of instruments and equipment at a monitoring site
- Weekly station visit servicing responsibilities
- Data handling including collection, analysis, reporting, and archive
- Video clips related to station servicing

The interactive CD is graphic-intensive and will be informative and beneficial to new, as well as veteran station operators. Look for it in your mail in June!

Annual data reports to be released in July

The 2000 annual data reports for the National Park Service ambient air quality network are expected to be completed and distributed to park staff and state agencies in July.

The reports will be distributed as hardcopy. The National Park Service also expects to have the reports posted in electronic format on the Internet. Watch for them at <http://www2.nps.gov/ard/gas>.

Surveys report DataView a timesaver

A DataView survey was sent to all air quality station operators last January and 29 operators responded. Most operators (27) find that the DataView system saves time and eliminates redundant recordkeeping. Most (24) have used DataView for 9 months or less and 19 rated its overall usefulness as "very good."

DataView features most liked include its timesaving ability, elimination of paperwork, and clear instructions. Least liked features include not allowing operators to change the sequence of checks, slow printing, and the inability to make corrections on the checklists or open more than one checklist at a time. Almost half of the operators (12) reported some bugs in the system.

ARS thanks the station operators for providing this valuable feedback to the DataView system. Future DataView generations will further incorporate operator's needs such as adding reminders of multipoint calibrations, saving data as text or Excel files, summing rainfall over various time periods, and generating additional graphic displays of the data. Most operators (22) would like remote access to the system from their office.

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What's inside:

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STATION OPERATOR FOCUS

Eruptions more than a pretty sight for Tamar Elias at Hawai'i Volcanoes NP

As the park's name implies, Hawai'i Volcanoes National Park has something that many other parks don't -- active volcanoes. Consequently, many air quality studies in and near the park focus on volcanic emissions. Tamar Elias, air quality station operator and chemist for the U.S. Geological Survey (USGS), studies volcanoes for more than just their beauty.

Tamar has operated and serviced the air quality stations at Hawai'i Volcanoes National Park since 1987. She currently services both the Visitor's Center and Jaggar Observatory stations, which have sulfur dioxide monitors and meteorological sensors (wind speed, wind direction, air temperature, relative humidity, and precipitation). Solar radiation is also monitored at the Visitor's Center and barometric pressure is monitored at the Observatory.

Station duties, however, comprise a small part of Tamar's work. As a chemist, Tamar monitors the eruption status of volcanoes on the island. "Volcanoes put out geochemical signals that allow us to monitor their restlessness and eruptions," says Tamar. "Kilauea has been erupting nearly constantly since 1983; many scientists study its volcanic processes because it is easily accessible." Kilauea is also the largest SO₂ producer in the nation.

Tamar moved to Hawai'i a few years after graduating from the University of California - Santa Cruz with a B.S. degree in chemistry. She started a small



Tamar Elias monitors the gases emitted from Kilauea volcano. The volcano is the largest sulfur dioxide producer in the nation, and is the center of attention for many scientists.

environmental monitoring business, worked briefly with the National Park Service, and shortly afterward took a position with the U.S. Geological Survey. She shares her home with 2 dogs, 1 cat, and 1 rabbit, and does "all the things you do when you're in Hawai'i," such as kayaking, snorkeling, and mountain biking.

Tamar's position is supported by the USGS Volcano Hazards Program, which provides funding and studies volcanoes from a hazards perspective. For information about the program, visit <http://volcanoes.usgs.gov> on the Internet. A fact sheet discussing volcanic air pollution and health hazards is available from the USGS at <http://wrgis.wr.usgs.gov/fact-sheet/fs169-97>.

DATA COLLECTION SUMMARY

Data collection statistics for July through December 2000 are listed below.

- Sites with final validation of ambient air quality parameter collection greater than 90% include:

Acadia	Great Smoky Mtns. (Look Rock)
Craters of the Moon	Hawaii Volcanoes (Observatory)
Denali	Hawaii Volcanoes (Visitor Center)
Death Valley	Lassen Volcanic
Everglades	Mammoth Cave
Glacier	Rocky Mountain
Grand Canyon	Shenandoah
Great Smoky Mtns. (Cades Cove)	Theodore Roosevelt
Great Smoky Mtns. (Clingman's Dome)	Yellowstone
Great Smoky Mtns. (Cove Mountain)	Yosemite

- Sites with final validation of ambient air quality parameter collection greater than 80% include:

Big Bend	Mount Rainier
Canyonlands	North Cascades
Chiricahua	Pinnacles
Great Basin	Sequoia-Kings Canyon (Lookout Point)
Hawaii Volcanoes (Thurston Lava Tubes)	Virgin Islands
Joshua Tree	Voyageurs
Mesa Verde	

- The entire network achieved an average of 89.6% final validation of ambient air quality parameters.

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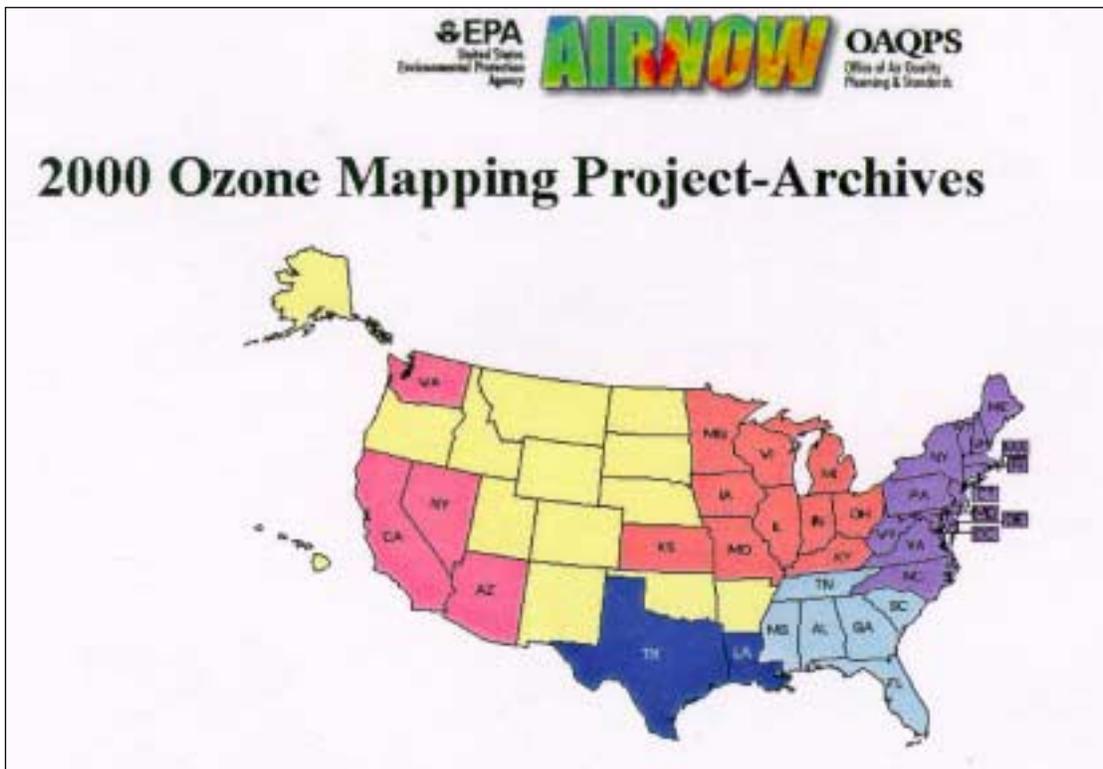
Ozone forecasting in the parks

If you have tried forecasting high ozone levels in your park, you probably know the value of a good coin toss. Five parks now have active programs that use ozone forecasts for public ozone advisories. The main trouble is that using our own monitoring data gives information too late in the day and the urban forecasts often aren't much help. Some basic techniques are presented on the NPS ozone advisory help page at <http://www2.nature.nps.gov/ard/gas/advisory/ozone.htm>, but there are some new developments. The EPA AirNow site has continued to expand and now offers more areas where forecasts are available (see AirNow at <http://www.epa.gov/airnow/> and get forecasts from <http://www.epa.gov/cgi-bin/airnow.cgi?MapDisplay=FORECAST>). Regional and state agencies are really the key to getting forecasts. Contact the agency nearest you and ask what they are doing. They may be able to extend their forecast range to include your area.

Computer power has now increased to the point that ozone forecast modeling 48 hours in advance is becoming possible. The NPS Air Resources Division

is having discussions with the modelers to use the model forecasts in the East. The National Oceanic and Atmospheric Administration (NOAA) has proposed an initiative to build an ozone forecasting capability using advance weather modeling and air pollution chemistry modeling. In the next five years we are likely to see these forecasting efforts expand to cover more areas. The view of regional ozone is likely to improve our understanding of transport and areas of influence.

The NPS ozone advisories are designed to help protect visitor and staff health and to promote awareness of the negative effects of air pollution on the parks. Current air pollution conditions can help and are being provided at Great Smoky Mountains, Grand Canyon, and Acadia National Parks, and at Craters of the Moon National Monument. Hawaii Volcanoes National Park will soon have an SO₂ pollution Web site. New communications abilities and on-site equipment provide the possibility to now poll and post hourly ozone data in near real-time for the public. The parks participating in AirNow are currently doing this. The NPS monitoring network could be a bigger part of real-time data presentation effort, especially in the West where there are many fewer ozone monitors. It is something to think about.



This map shows the areas now included in the AirNow ozone mapping that can help with forecasts and current conditions.

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FEATURE ARTICLE

Hawai'i Volcanoes NP uses SO₂ advisory system to alert employees and visitors

Introduction

Hawai'i Volcanoes National Park is unique in that volcanic emissions are the major cause of sulfur dioxide (SO₂) in the park's air. In an effort to protect human health, an SO₂ advisory system was designed to alert park personnel of the near real-time SO₂ levels monitored in the park.

Air Resource Specialists, Inc. completed installing the SO₂ monitors, meteorological sensors, and computer hardware and software for the system in February 2001. The system is being used routinely by the park and the monitoring equipment is serviced weekly as part of routine ambient air quality station checks.

The problem

Hawai'i Volcanoes National Park experiences SO₂ levels that exceed the national ambient air quality standard multiple times each year. When the SO₂ and other gases emitted from nearby Kilauea volcano react with air, moisture, and sunlight, they create what locals know as vog, or volcanic smog. The vog is comprised of a variety of components including neutral and acid sulfates which may cause respiratory and other health problems. The advisory system will help park officials alert park employees and visitors when SO₂ concentrations in the atmosphere rise, so appropriate action may be taken to protect human health.

The system

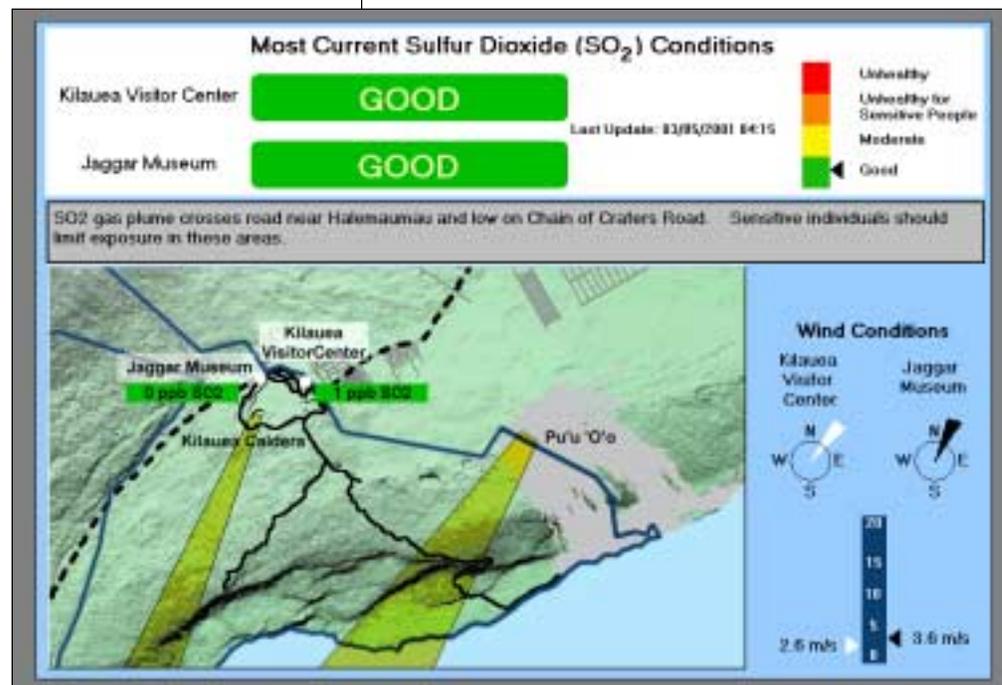
The National Park Service, in cooperation with the USGS, operates two SO₂ monitors in Hawai'i Volcanoes National Park. One is near the Kilauea Visitor Center and the other is at the Jaggar Museum, approximately 2 miles away. The monitors are located on the northwest and northeast rims of Kilauea Caldera, as seen in Figure 1. Wind speed and wind direction sensors help track the airborne emissions; air temperature and relative humidity are also measured.

The monitoring equipment is connected via modem to a personal computer located at the park dispatch office. The gaseous and meteorological data from both stations are transmitted every 15 minutes to the computer, which displays a screen similar to that seen in Figure 1.

Every 15 minutes the screen updates, displaying the current SO₂ concentrations in parts per billion (ppb), as well as wind conditions, measured at the two monitoring stations. The map, which includes the most populated areas of the park, displays approximate paths for the main SO₂ plumes. As shown below, the main SO₂ sources are the Kilauea Caldera and the Pu'u 'O'o vent, which currently emit roughly 100 and 1500 tons of SO₂ per day, respectively.

Figure 1. An example computer display in the park dispatch office, in Hawai'i Volcanoes National Park, shows SO₂ levels and wind conditions at 4:15 a.m. on March 5, 2001.

The color-coded scale shows the SO₂ levels are in the good range.



As Figure 1 shows, the scale of SO₂ concentration ranges from good (green, <300 ppb) moderate (yellow, 300-499 ppb), unhealthy for sensitive people (orange, 500-999 ppb), and unhealthy for all people (red, ≥1000 ppb). The wind pattern display provides information that helps determine if high ambient SO₂ conditions may improve.

The park office dispatcher monitors the computer and alerts other park personnel when unhealthy conditions exist. Depending on the severity of the condition, various safety measures may be taken including closing visitor center doors and windows, canceling or relocating hikes and other outdoor work, and temporarily closing the entrance stations and visitor centers.

The system also allows for data plots to be displayed and printed. Figure 2 is an example data plot showing the SO₂ concentrations, wind speed and direction, temperature, and relative humidity for the two monitoring stations. This plot allows the user to see the similarities and differences of measured parameters for the two sites.

The advisory system will also soon be expanded to display the current conditions on the Internet. The Internet connection will also be updated at 15-minute intervals, and is expected to be complete later this spring or early summer.

National SO₂ monitoring

The following nine sites monitor SO₂ in the National Park Service network:

- Cape Cod National Seashore, MA
- Congaree Swamp National Monument, SC
- Great Smoky Mountains National Park - Cove Mountain, TN/NC
- Hawai'i Volcanoes National Park - Kilauea Visitor's Center, HI
- Hawai'i Volcanoes National Park - Observatory (Jaggar Museum), HI
- Mammoth Cave National Park, KY
- Olympic National Park, WA
- Shenandoah National Park, VA
- Theodore Roosevelt National Park, ND

Sulfur dioxide emissions are most commonly associated with the burning of fossil fuels such as coal and oil at power plants and refineries. The gas is also easily converted to other sulfur-based gases and aerosols including sulfuric acid, the major component of acid rain, and sulfate aerosols, a major component of visibility reduction. Most of the SO₂ monitoring sites are located in the eastern United States, where ambient levels are high and secondary effects such as acid rain and visibility reduction are major problems.

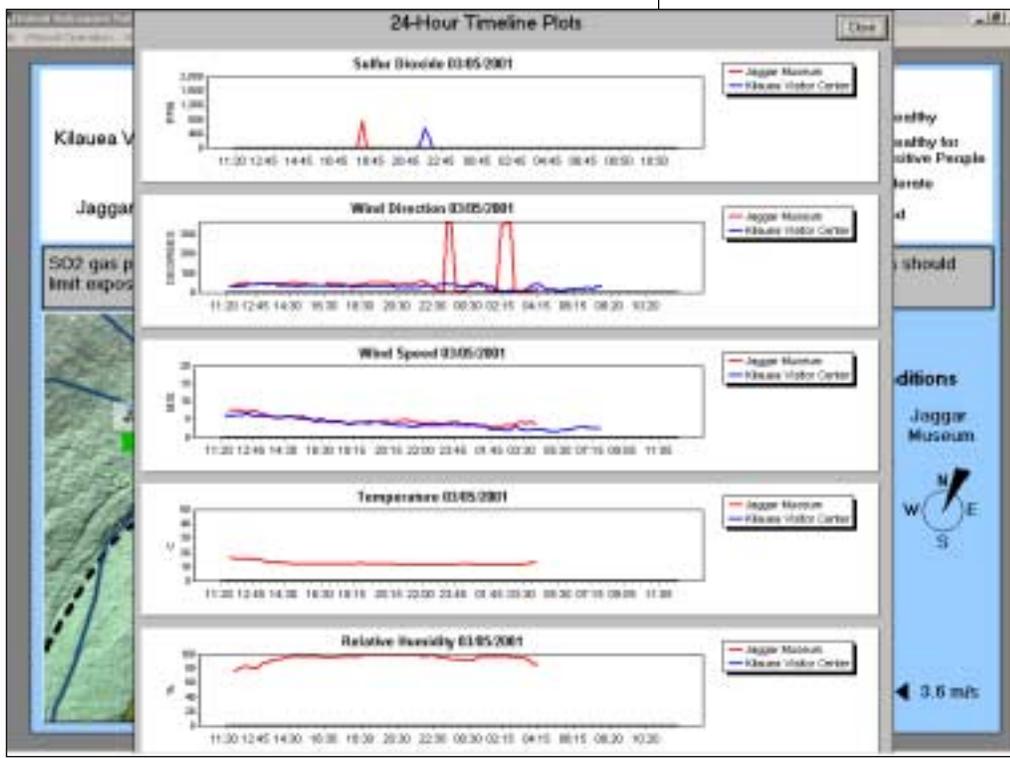


Figure 2. The advisory system computer display can also show time-series plots of SO₂ levels, wind direction, wind speed, air temperature, and relative humidity. Values are displayed for both the Kilauea Visitor Center and Jaggar Museum instruments.



OPERATOR'S TOOLBOX

Viewing checklists and checklist instructions simultaneously

Many station operators have found that simultaneous viewing of both the station checklist and checklist instruction helps them to complete the checklist efficiently and accurately. The checklist instruction may also be viewed with different levels of magnification for easier reading.

How can you do this? With just a few clicks of your mouse you can change your DataView laptop's Windows environment to view two windows at once.

To view both the station checklist and its instruction, first open the checklist. (You'll most likely already have this open when you realize you need to view the instruction). Click **Get Instruction** from the bottom of the checklist. The instruction will cover up the checklist as it opens on the screen. Then, **right-click** on the task bar at the bottom of the screen. This is the gray bar that appears horizontally along the bottom of your display, and holds items such as the current time, the Start button, and what software is currently in use. When you right-

click on the bar, a short menu will appear; click on **Tile Windows Horizontally**.

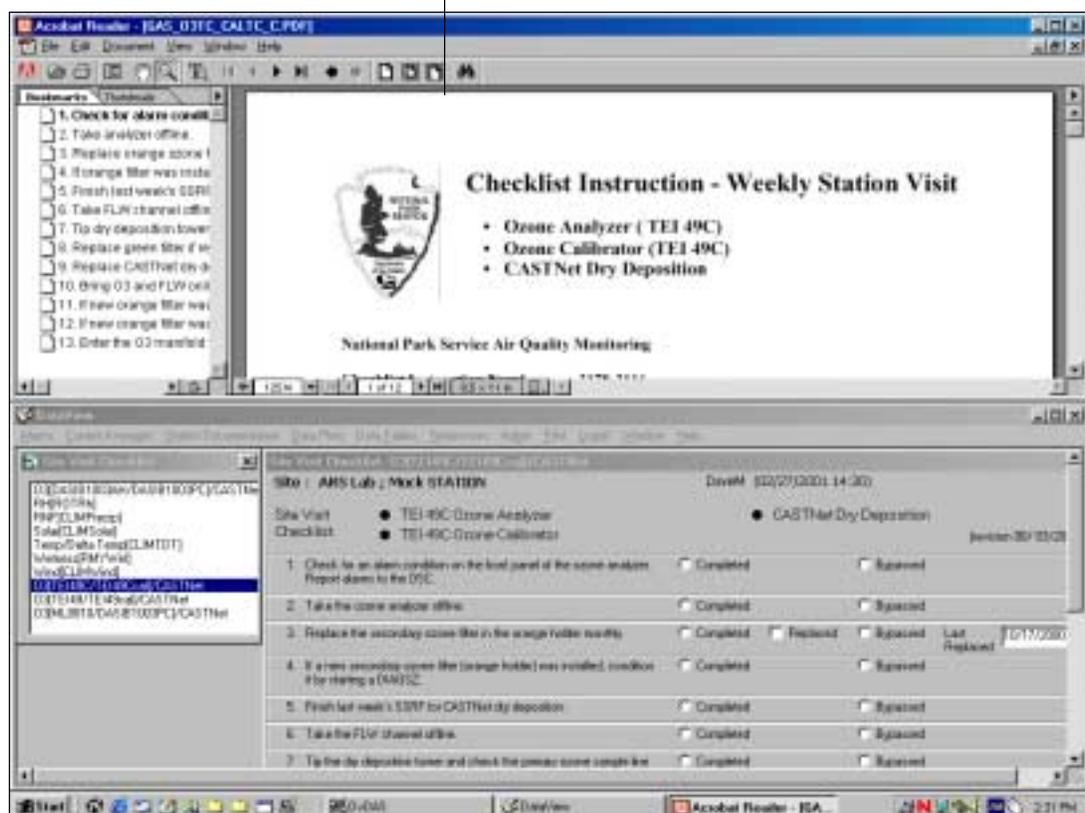
The checklist instruction will reduce in size to cover the top half of your display, and allow the checklist (previously hidden beneath the instruction) to appear on the bottom half of your display.

Since the instruction is in Adobe .PDF format, you may click the page icons or the magnifying glass icon at the top of the screen to enlarge the text for comfortable reading. Scroll to the point that contains the information you need.

To return to normal viewing of the checklist, close the instruction and click the maximize button of the checklist (a graphic square found in the upper-right portion of the window). If you need assistance with this, or any DataView function, call ARS at 800/344-5423.

The figure below shows an example DataView screen display with the two windows tiled horizontally, showing the checklist on the bottom and the checklist instruction on the top.

DataView display screen shows a tiled view of a checklist instruction (filling the top half of the screen) and the corresponding instrument checklist (filling the bottom half of the screen).



LAB TALK

Why precision, span, and zero checks are performed

Automated precision, span, and zero checks (PSZs) occur nightly (or weekly, depending upon configuration) at all the NPS operated ozone and sulfur dioxide monitoring stations. It is important that these checks are kept within tolerance.

Precision check data are compiled by site quarterly, and are statistically analyzed to assess the *precision*, or repeatability of the measurement in question. Precision does not assess accuracy (audits do this), rather, it provides an understanding on how *precise* an individual measurement is. The EPA recommends valid precision checks be completed six times per quarter. Our daily (or weekly) schedule allows for at least twice that amount. A *valid* precision check requires the analyzer be subjected to an input concentration of between 80 and 100 ppb, and its response must be within 10% of the transfer standard (calibrator). Precision data are reported to the Aerometric Information Retrieval System (AIRS) along with hourly averaged data.

Zero and span checks are used to assess an analyzer's ability to stay within a prescribed set of conditions. If a response falls out of prescribed limits, the data are considered suspect, and investigation into the cause and possible instrument repair or maintenance is warranted. Zero and span checks are conducted daily, and results are stored within both the datalogger and the DataView system.

ARS retrieves and reviews these data daily to assess the operational status of every analyzer in the network.

Retrieving and viewing precision, span, and zero data on site is most conveniently done through the DataView system. From within DataView, click **Data Plots**, then **StackPlots**. Select **Calibration Stackplot** and **8-** (or **15-**) **Day**. Then choose your *start date* and select **Draw**. A printable graph of recent precision span and zero data will appear. Here at ARS, we review all site's PSZ's on a daily basis, but we encourage you to do the same during your weekly station checks. Should you have any questions, please call any of ARS' field specialists.

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CASTNet 1999 annual report available

The Clean Air Status and Trends Network (CASTNet) has released its annual report for 1999. It is available at <http://www.epa.gov/castnet/reports.html>.

The report presents ambient concentrations of measured parameters and the deposition of nitrogen species. The report is rich with graphics showing 1999 measurement values and 10-year trends. It concludes with a discussion of quality assurance.

Figure 1 below shows the locations of monitoring stations that participate in the CASTNet program.

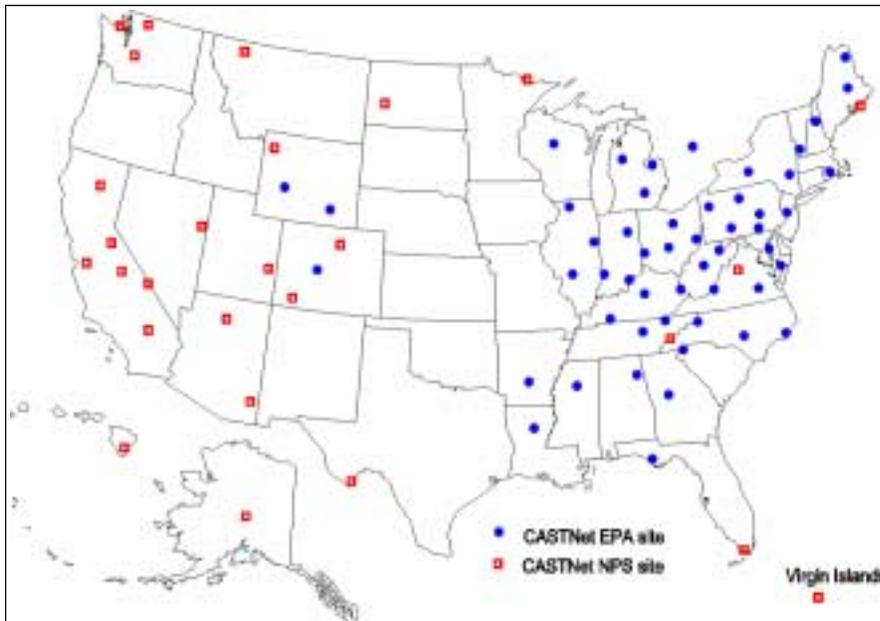


Figure 1. The CASTNet monitoring program, established in 1987, includes over 70 monitoring stations. Most stations are operated by the EPA; about 25 are operated by the NPS in cooperation with the EPA.

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PAC2000 workshop concludes with air quality awareness products

The PAC2000 training workshop held at Channel Islands National Park, California, last December provided attendees with information on how to use air quality data and how to create educational or informational products. Attendees from 16 parks, many of them air quality station operators, participated in the workshop.

Specialists from the NPS Air Resources Division, regional air quality coordinators, a park biologist, and an air quality consultant, provided information on how to find, access, interpret, and use a variety of data, including gaseous pollutant, meteorological, emissions inventory, air quality related values, and visibility data.

Attendees learned through laboratory sessions how to use Synthesis and WinHaze software, and learn about the different types of data. At the conclusion of the workshop, attendees created their own park-specific air quality product. Example products include a park visitor folio, a slide presentation and brochure regarding personal watercraft pollution, a slide show regarding sulfur dioxide issues, training materials for seasonal staff, and materials to promote awareness of agricultural burning and its effects on parks.

NEWS FROM THE FIELD



Modernization of the network

As most operators are aware, a wide variation of age and type of equipment exists in the NPS network. Over the years the NPS ARD has prioritized equipment upgrades to ensure that the network remains viable. Equipment that has reached its useful life is retired and new equipment is provided. In recent years, we have completely retired the SumX dataloggers, the Climatronics relative humidity sensors, and the Monitor Labs 8550 calibrators. Ten sites have received replacement shelters, and all sites have new laptops for the DataView system. ARS is currently in the process of refurbishing several "previously owned" TECO 49 ozone analyzers and anticipating the purchase of several pairs of new TECO 49C ozone analyzers and calibrators.

Network modernization and upgrades are key to the continued collection of high quality data. Your dedication to learning the new systems and your continuing attention to detail while completing your site visits make the network a success. If you have a particular suggestion or upgrade idea, please participate in the future direction of the program by voicing those ideas to any of the support technicians at ARS, or directly to John Ray or Dave Maxwell at NPS ARD.

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